

bly dry or wet seasons are more likely to be followed by nearly normal seasons than by the complementary characteristics; so that here again, as with temperature, it is not true that a warm or a dry winter is followed by a cold or wet summer, or vice versa.

FRESHETS IN JAMES RIVER, VA.

The annual summary of the Virginia section contains an excellent article on the combinations of circumstances that bring about freshets in the James River. We copy the following table showing the principal freshets during the past thirty years. Concerning these cases, twenty-six in all, Mr. E. A. Evans says:

Fourteen, or 54 per cent, occurred during months when the absorption by the soil and the evaporation by the wind were at a minimum; five, or 19 per cent, when evaporation was greater, but absorption was retarded by the prior sodden condition of the ground; seven, or 26 per cent, occurred when both evaporation and absorption were at a maximum, but when the rate of rainfall was greater.

Maximum river gage readings showing height above low water during important freshets in the James River, Va.

Date.	Lynchburg.	Scottsville.	Columbia.	Richmond.*	Ratio of Columbia to Richmond.
	Feet.	Feet.	Feet.	Feet.	Per ct.
October, 1870.....	14.4	23.8	39.0	27.0	69.3
November, 1877.....	11.8	26.3	37.5	26.6	76.3
March, 1884.....	9.8	14.0	20.0	13.7	68.5
March, 1884.....	12.2	17.4	24.0	15.7	65.4
October, 1885.....	13.0	16.2	30.5	15.9	52.1
November, 1885.....	.....	.....	30.5	14.2	46.4
January, 1885.....	.....	17.0	24.0	14.7	61.1
April, 1886.....	10.8	22.5	32.0	24.3	75.9
July, 1886.....	.....	.....	23.8	17.2	72.3
August, 1889.....	.....	.....	29.5	22.5	76.3
June, 1889.....	.....	.....	32.5	25.2	77.5
April, 1891.....	.....	.....	20.5	14.4	70.2
January, 1892.....	.....	.....	20.3	13.5	66.5
May, 1893.....	13.9	17.8	27.0	16.9	62.6
January, 1895.....	10.5	18.4	28.8	18.2	64.2
March, 1895.....	.....	.....	20.0	12.7	63.5
April, 1895.....	15.3	19.2	26.0	16.4	63.0
July, 1896.....	10.2	14.2	19.3	12.5	64.9
October, 1896.....	15.7	.....	28.5	16.7	58.6
February, 1897.....	.....	.....	21.7	11.9	55.3
February, 1897.....	.....	17.5	26.2	15.0	57.3
October, 1898.....	12.0†	.....	.....	11.7	.....
January, 1899.....	8.6†	.....	.....	13.5	.....
February, 1899.....	5.6†	.....	.....	22.0	.....
March, 1899.....	19.0†	.....	.....	20.5	.....
March, 1899.....	7.7†	.....	.....	13.6	.....

*Readings taken from United States James River improvement gage until 1897, when they were taken from Bureau gage. †On Bureau gage.

PHENOLOGY IN OHIO.

In the annual summary of the Ohio section Mr. J. Warren Smith, Section Director, discusses the question of the relation of temperature to the date of harvesting wheat. The harvest data for twelve consecutive seasons at Wooster, Ohio, and for forty-four consecutive years at Osborn, Ohio, are compared with the mean temperatures and total rainfall of April, May, and June at the same or neighboring stations. In general, Mr. Smith finds that the dates and the temperatures fluctuate together, the dates being earlier in proportion as the mean temperature of the three months is above the normal and late when the temperature is below the normal. On the contrary, the precipitation varies inversely as the date; a deficit in rain causes an earlier harvest. Thus in 1899 the date of harvesting was the earliest on record, coinciding with the greatest recorded deficiency in rainfall.

As this study relates to winter wheat, we may remark that it has been customary for European students usually to calculate the sum total of the effective temperatures from the

date of sprouting, and it is likely that such calculations would have made some appreciable differences in the Ohio temperatures. With regard to precipitation, we are inclined to think that the acceleration of the date of harvest by droughts and clear weather, or its retardation by rain and cloudy weather is mostly effected during the three months, April, May, and June, tabulated by Mr. Smith. However, we think that the total temperature or rainfall for the month of June ought scarcely to be considered in studying those years in which the wheat ripens as early as June 20.

As the dates of harvesting winter wheat may be needed by others in climatological studies we reprint the figures given by Mr. Smith. On the average, the Wooster date is 6.6 days later than the Osborn date:

Dates of harvesting wheat.

Year.	Osborn, Ohio.	Wooster, Ohio.	Year.	Osborn, Ohio.	Wooster, Ohio.
1856.....	June 28	.....	1878.....	June 25	.....
1857.....	July 16	.....	1879.....	June 27	.....
1858.....	July 1	.....	1880.....	June 21	.....
1859.....	June 28	.....	1881.....	.....	.....
1860.....	June 25	.....	1882.....	July 4	.....
1861.....	July 1	.....	1883.....	July 6	.....
1862.....	June 30	.....	1884.....	July 3	.....
1863.....	June 30	.....	1885.....	July 9	.....
1864.....	July 1	.....	1886.....	June 28	.....
1865.....	June 29	.....	1887.....	June 23	.....
1866.....	July 6	.....	1888.....	July 4	July 8
1867.....	July 1	.....	1889.....	June 29	July 3
1868.....	July 6	.....	1890.....	June 27	July 3
1869.....	July 5	.....	1891.....	June 27	July 1
1870.....	June 25	.....	1892.....	June 29	July 2
1871.....	June 26	.....	1893.....	July 3	July 8
1872.....	July 4	.....	1894.....	June 28	July 8
1873.....	July 1	.....	1895.....	June 25	July 6
1874.....	June 26	.....	1896.....	June 22	July 3
1875.....	July 12	.....	1897.....	July 2	July 7
1876.....	July 1	.....	1898.....	June 23	July 2
1877.....	June 29	.....	1899.....	June 20	June 27

HAIL AND ITS METHODS OF FORMATION.

In the March report of the Virginia section Mr. E. A. Evans, Section Director, gives some interesting items with regard to the unusual features of the snowstorm of March 25, 1900:

The morning of this date was cloudy, with a fresh, chilling, north-east wind. The temperature rose slowly during the forenoon, and at 1:17 p. m. a light rain began to fall. Soon sleet accompanied the rain, and later the rain ceased and sleet alone fell. Some of these icy particles were nearly cubiform, measuring perhaps one-fourth of an inch either way. Mixed with these was the sleet ordinarily seen—the small spheres of frozen rain. At 5:25 p. m. moist snow fell with sleet. At first the flakes were not large enough to be specially noticeable, but as the fall of sleet diminished in volume, which it immediately did, the size of the flakes increased until they attained unusually large proportions. They were of irregular shape, mostly oblong; several were seen the greatest diameter of which could hardly be covered by a teacup. Some were caught upon a piece of dry wood and examined. In every instance the center of the flake was composed of a soft mass of snow about half an inch in diameter, while the outer edges were thin, looking as though they might have been separate flakes which had attached themselves to the central mass while it was falling. The weight of the center being greater than that of the edges caused the larger ones to assume the form of an inverted cone in falling, the outer edges being bent up by the resistance of the air.

Three of the large flakes were caught in a bowl, yielding, when melted, nearly a tablespoonful of water. There was nothing at hand from which an absolute measurement could be had, but it is estimated that it would have closely approximated one one-hundredth of an inch. The flakes were widely separated from one another and did not obscure the vision in looking upward toward the sky.

The above interesting description reminds one of the natural snowballs described by the observers on Pikes Peak during the early years of the occupation of that station. These balls are said to have been 2 or 3 inches in diameter, and it was supposed that by melting and recongealing as they fell they formed icy hail with snowy nuclei. In the present case the lenticular snowflakes are said to have had a denser mass of